A modification of the interpretation on these lines, however, does not affect the general hypothesis as to the existence of several types of white flowers, or the inference that pigment is not necessarily produced although all the requisite ingredients for the production of colour may be present.

On the Occurrence of a Ganglion in the Human Temporal Bone not hitherto Described.

By Albert A. Gray.

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(Plate 6.)

The existence of a previously unknown nerve plexus associated with a comparatively large ganglion embedded in the substance of the human temporal bone must be regarded as a somewhat surprising fact at this period in the history of human anatomy. It may be well, therefore, to describe in a few lines the process which led to the discovery.

While making some preparations of the middle ear of animals according to my own method, I discovered the presence of a large plexus of nerves on the posterior surface of the bulla of the sheep. This plexus was found to be composed of bundles derived from the pneumo-gastric and the facial nerves. Since the preparation was only macroscopic, I was unable to ascertain whether nerve ganglion cells were present. Such a plexus has not been described in the human subject, unless the two minute bundles of fibres which pass between Arnold's nerve and the facial nerve be dignified by the name of plexus. It seemed, therefore, highly probable to me that some corresponding structure might exist in the human subject which had not hitherto been described, and a search was accordingly made.

The initial difficulty lay in the fact that this portion of the temporal bone is very different in man from that in the sheep. In the latter there is a large bulla, but no mastoid process; whereas in man there is a large mastoid process and no bulla. In man the only indication of a bulla is the little *cul-de-sac* which runs backwards from the lower, inner, and posterior corner of the tympanum. In the human subject a mass of bone fills the space which in mammals is occupied by the bulla. The plexus,

therefore, if present in the human subject, would probably lie embedded in bone. The second difficulty lay in the fact that the structures in the region involved do not have the same relationship to one another in the human subject as in the sheep. The stapedius muscle, for example, lies below, internal to, and in front of the facial nerve in man, not above it as in the sheep.

The plexus which was seen in the sheep had a position a little below the lower termination of the stapedius muscle, and internal to the facial nerve. Since the stapedius muscle has, so to speak, been rotated downwards and inwards in man, as compared with the position which it occupies in the sheep, the most likely place for the plexus would be a little below the lowest point of the origin of the stapedius muscle. This clue was followed, and, as will be shown later, the inference was justified by the result.

The petrous portion of a human bone was removed in the fresh state and a small piece, including the region indicated above, was decalcified and prepared for microscopic section. The preparation, after very complete decalcification, was embedded in celloidin, and sections in the vertical plane were made from before backwards. The sections were stained with iron-alum and hæmatoxylin.

The series of sections was not complete, but it was quite sufficient to reveal the existence of a plexus, corresponding to that of the sheep, but very much smaller in size. Owing to the incompleteness of the series it cannot be definitely stated what is the exact origin of all the bundles which go to compose the plexus, but it is clear that they are derived from at least two sources: first, the facial nerve; second, the auricular branch of the pneumogastric.

While it was interesting to discover this plexus in man, a much more remarkable fact was also revealed. This was the presence of a comparatively large ganglion associated with the plexus, and, like it, embedded in bone. The first impression on finding this ganglion was that it was a portion of one of the ganglia of the glossopharyngeal or pneumogastric nerves. But closer examination showed that this could not be the case, because it was at a considerable distance from the trunks of these nerves, and, moreover, it was embedded in bone.

A further search was then made among the writer's macroscopic preparations of the temporal bone, and the ganglion was discovered to be present in it also. It is shown in Plate 6, fig. 1, which is taken from the writer's text-book on 'Diseases of the Ear.' It will be seen that the ganglion, *g.g.*, lies immediately below the inferior termination of the stapedius muscle, and about the same distance in front of the facial nerve in the vertical portion

of its course. The auricular branch of the pneumogastric nerve passes upwards from the jugular fossa through the bone towards the ganglion (Plate 6, fig. 1, *a.p.*).

The general position of the ganglion having now been described, it remains to give a few details concerning its finer structure. This can only be done from a series of microscopic sections. Such a series was made, but the decalcification process was too energetic, and in some of the sections portions of the bone and even portions of the ganglion itself have been washed away.

The ganglion is very irregular in shape, and is surrounded on all sides by bone. As a result of this irregularity in shape different portions of the structure come into view in different portions of the same section, so that at first sight it would appear that there are two or more ganglia. But when the series is studied carefully it is found that this appearance is merely due to the presence of outlying semi-detached portions of one ganglion.

The name which I propose to give to the structure is "the Stapedial Ganglion." It is situated close to the lowest point of the stapedius muscle in man, and the name suggested is, perhaps, as appropriate as any.

The first section (fig. 2) passes through the anterior portion of the ganglion. Considerable portions both of the bone and of the ganglion itself have been lost in the course of preparation, but the upper and lower parts of the latter are seen, *g.g.* The posterior semicircular canal is seen to the left of the uppermost portion of the ganglion, and the jugular fossa is shown in the left lower part of the photograph. A bundle of fibres derived from Arnold's nerve runs in the direction of the ganglion.

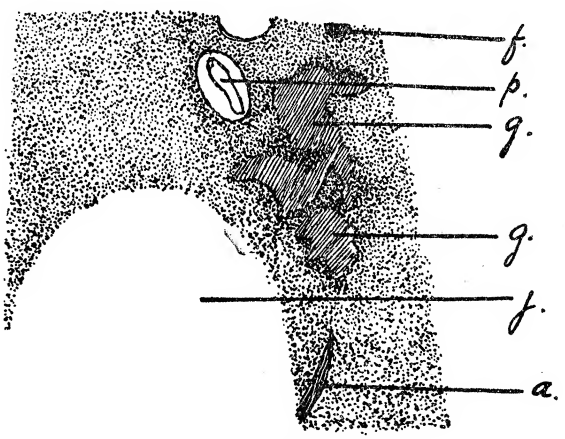

FIG. 2.

f. facial nerve ; *p.* posterior semicircular canal ; *g.g.* ganglion ; *j.* jugular fossa ; *a.* auricular branch of vagus nerve.

In the next section (fig. 3) the ganglion is seen to be much reduced in size, and now appears as one piece which is quadrilateral in shape. The facial nerve shows rather more in this section as it is beginning to turn downwards.

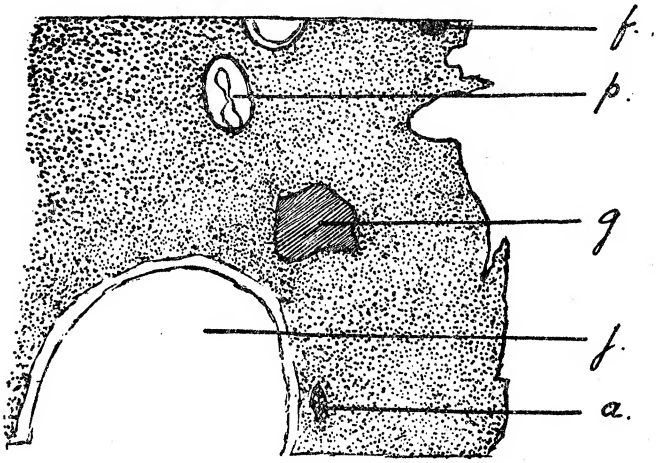

FIG. 3.

f. facial nerve ; *p.* posterior semicircular canal ; *g.* ganglion ; *j.* jugular fossa ; *a.* auricular branch of vagus nerve.

On coming to examine the minute structure of the ganglion there arises the difficulty that, in the human subject, the structures have undergone considerable *post-mortem* changes, owing to the fact that they cannot be put into the fixing fluid until a considerable time after death. Besides this difficulty another occurs in this special case, in that the fixing fluid takes some time to penetrate the bone which surrounds the ganglion. It is impossible, therefore, to give any satisfactory description of the minute intracellular appearances of the nerve-cells of the ganglion. As regards their general appearance, however, some points are obvious.

As a whole the ganglion contains a rather large proportion of nerve-fibres relative to the number of nerve-cells, Plate 6, fig. 4. The nerve-cells are present in numerous groups which are separated by bundles of fibres, and it is quite impossible to say whether all the fibres are connected with the nerve-cells of the ganglion or not.

As regards the cells themselves the majority are multipolar, and in this respect they differ from those found in the terminal ganglia of the eighth nerve, which are bipolar. In the stapedial ganglion there are also a few bipolar cells to be found in the upper portion (Plate 6, fig. 4), but this does not alter the general statement that the cells are multipolar in character.

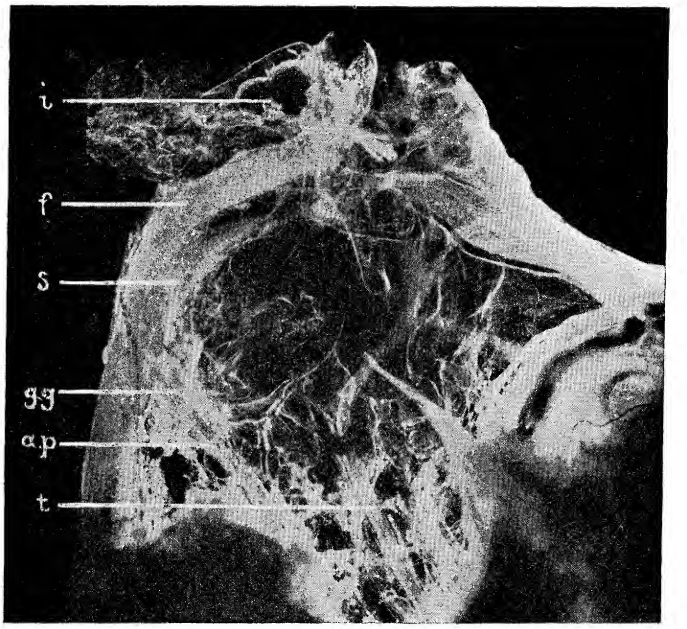

FIG. 1.

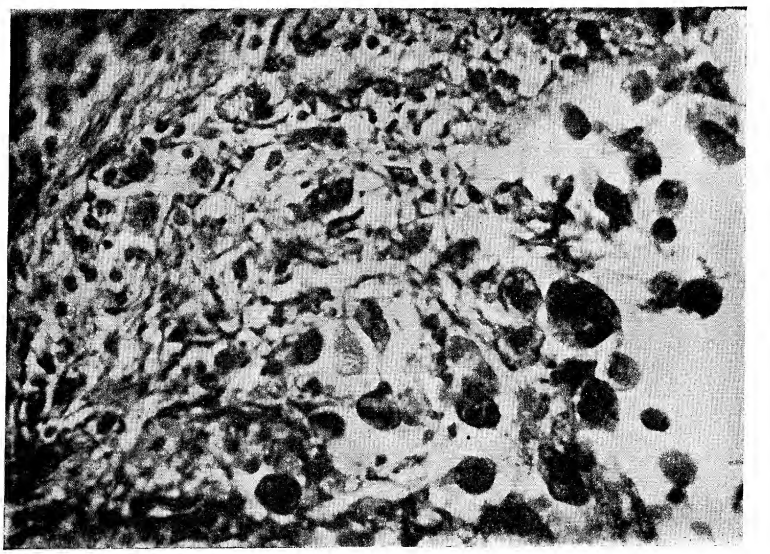

FIG. 4.

It is hardly possible at present to speak of the physiological significance of this ganglion. Experiment and careful pathological and clinical observation alone can determine this. There is, however, one very interesting clinical fact which is probably worth consideration in this respect. There is a very common form of deafness, unassociated with middle ear disease, and termed otosclerosis. Among other symptoms of this affection are, a diminution in the secretion of wax in the external meatus, and a diminished sensitiveness of the tympanic membrane and the posterior wall of the meatus. These are the regions supplied by Arnold's nerve which is formed by the union of bundles from the pneumogastric and facial nerves. As the stapedial ganglion is composed of fibres derived from both of these nerves it is very possible that autonomic fibres run from it to the parts mentioned. This would account for the diminished secretion of wax in the cases mentioned above.

DESCRIPTION OF PLATE 6.

FIG. 1.—The soft structure of the human middle ear.

i. incus ; *f.* facial nerve ; *s.* stapedius muscle ; *g.g.* ganglion ; *a.p.* auricular branch of vagus nerve ; *t.* nerve of Jacobson.

FIG. 4.—Section through ganglion showing the nerve cells. × 250 *ca.*

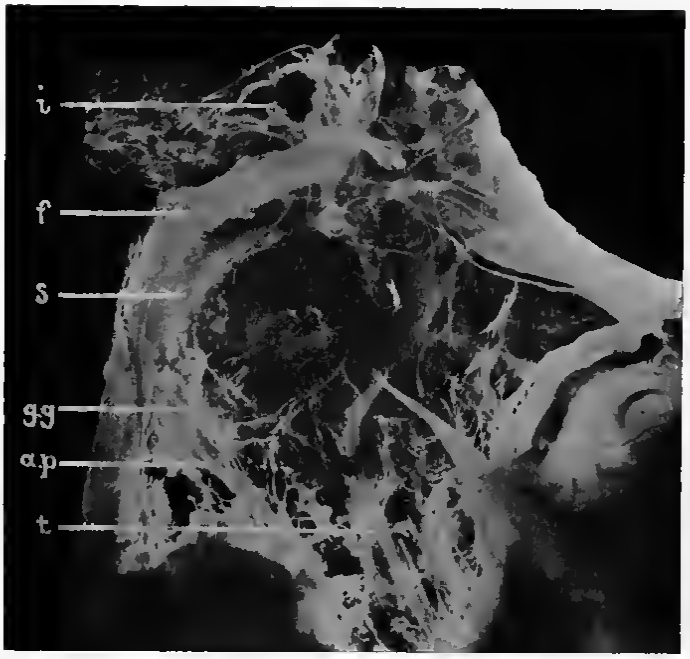

FIG. 1.

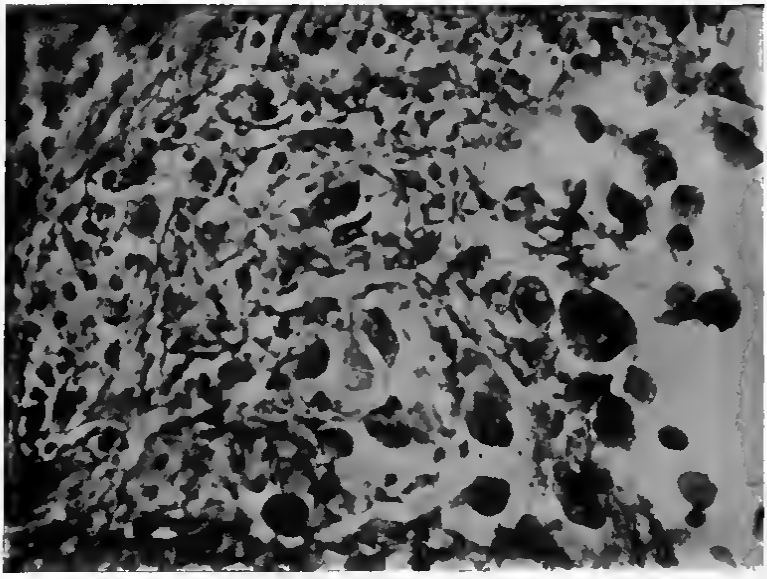

FIG. 4.